

## REMARKS

### Status of the Claims

Claims **1-5, 9-17, 19-20, 22-23, 25-29, 33-38, 40, 42-43, 45-46** and **48** were presented for examination. In the Office Action, claims 1, 2, 4, 5, 8-11, 21, 23, 24, 27, 28 and 39-44 were rejected under 35 USC 102(b) as allegedly anticipated by U.S. Patent 5,506,861 to Bottomley (hereafter "Bottomley"). Claims 14-17, 19, 20, 22, 23, 25, 37, 38, 40, 42, 43, 45, 46 and 48 were rejected under 35 USC 102(b) as allegedly anticipated by U.S. Patent 5,790,588 to Fukawa *et al.* (hereafter "Fukawa"). Claim 3 was rejected under 35 USC 103(a) as allegedly being unpatentable over Bottomley in view of admitted art (paragraph 0004 of the application). Claims 12, 13, 35, and 36 were rejected under 35 USC 103(a) as allegedly being unpatentable over Bottomley in view of U.S. Patent 6,317,612 to Farsakh (hereafter "Farsakh"). Claims 14, 15, 16, 17, 19, 20, 22, 23, 25, 37, 38, 40, 43 and 46 stand provisionally rejected under nonstatutory obviousness-type double patenting in view of claims 13, 13, 16, 15, 16, 17, 18, 19, 20, 31, 31, 33, 35 and 37 respectively of Applicant's co-pending application No. 09/788,890. No amendments have been made to the claims. Upon entry of this Response, claims **1-5, 9-17, 19-20, 22, 23, 25-29, 33-38, 40, 42, 43, 45, 46**, and **48** will be presented for examination.

### 35 USC 102(b) Rejections: Claims 1, 2, 4, 5, 8-11, 21, 23, 24, 27, 28 and 39-44

In the Office Action, claims 1, 2, 4, 5, 8-11, 21, 23, 24, 27, 28 and 39-44 were rejected under 35 USC 102(b) as allegedly anticipated by Bottomley. In particular at pages 2-3 the Examiner cites column 5, lines 7-22 and column 16, lines 33-47 as allegedly anticipating the final two elements of Applicants base claims 1 and 27. These two elements pertain to properties of the second vector output from the correlation shaper and the transformation provided by the correlation shaper:

"...the second vector output is substantially uncorrelated on at least a subspace; and the transformation substantially minimizes a mean-squared-error relationship between the second vector output and first vector output.

Applicant respectfully traverses the rejection. At column 5, lines 7-22 Bottomley does not disclose a second vector output which is substantially uncorrelated on at least a subspace. Rather, Bottomley describes a decorrelation matrix consisting of "signature sequence

crosscorrelation values.” (Col. 5, lines 17-21.) Bottomley has not addressed the issue of random noise in this discussion. Applicant has identified a problem with such prior art decorrelators as discussed and described in paragraphs 0004-0006, and in particular, 0034 of Applicant’s published application. Applicant has described that a problem with such decorrelator receivers is that their output signals remain correlated due to the noise component shared by the received signals. Applicant submits that Bottomley’s disclosed matrix does not produce an output uncorrelated on at least a subspace.

Applicant has devised transformations for correlation shapers which can better address the problems identified with prior art receivers. These transformation matrices  $\mathbf{W}$  are indicated at paragraphs 0064-0070, and apply to particular embodiments as described in the application.

At column 16, lines 33-47, Bottomley surmises that MMSE techniques “can be applied to possibly enhance the decorrelation process,” and teaches (lines 40-46) that the technique comprises adding, term by term for the equations represented in column 15, line 24, a value proportional to the noise power, and that this addition process depends further upon the characteristics of the noise, white or non-white. It is also noted at column 15, lines 26-32, that the equation can at best be solved approximately. Although this may be one approach to employing an MMSE technique, this is not what Applicant claims. Applicant claims a second vector output with a particular characteristic produced from a first vector by a transformation which occurs after decorrelation and a property of that transformation. Further, Applicant has identified a problem with prior art MMSE receivers which require pre-knowledge of noise characteristics (paragraph 0005) and notes that the teachings of Bottomley require pre-knowledge of noise characteristics. In contrast, Applicant has devised transformations that provide improved results without pre-knowledge of noise characteristics

For at least the above reasons, Applicant submits that Bottomley does not disclose each and every element of Applicant’s base claims 1 and 27. Accordingly, Applicant requests reconsideration and withdrawal of the rejections of claims 1, 2, 4, 5, 8-11, 21, 23, 24, 27, 28 and 39-44 under 35 USC 102(b).

*35 USC 102(b) Rejections: Claims 14-17, 19, 20, 22, 23, 25, 37, 38, 40, 42, 43, 45, 46 and 48*

In the Office Action, claims 14-17, 19, 20, 22, 23, 25, 37, 38, 40, 42, 43, 45, 46 and 48 were rejected under 35 USC 102(b) as allegedly anticipated by Fukawa. In particular at pages 3-

4 of the Office Action, the Examiner cites column 19, lines 43-67 as disclosing minimization of a mean square of an error signal following an LMS algorithm.

Applicant respectfully traverses the rejection. In particular, the Examiner has not identified where Fukawa discloses each and every element of Applicant's base claims 14 and 37. Applicant submits that the Examiner has not identified where Fukawa discloses a receiver wherein a bank of correlators *cross-correlates the received signal with a set of signals* to produce a vector output, and *wherein the set of signals is determined by minimizing the least-squares error between the set of signals and the set of signature signals*.

Fukawa is directed to spreading signals by short code forms and long code forms and despreading the signals in a receiver with corresponding short code forms and long code forms. Fukawa employs additional spreading codes which add complexity to the system, and is not what Applicant's invention is directed to. Further, one would not look to the teachings of Fukawa with its added complexity to arrive at Applicant's claimed invention. At column 19, lines 43-67 Fukawa discloses iteratively correcting a tap coefficient vectors  $\mathbf{W}_1$  and  $\mathbf{W}_2$  so as to "minimize the mean squares of error signals  $e_1$  and  $e_2$ ." At column 19, lines 21-31 Fukawa defines the error signals  $e_1$  and  $e_2$  as being differences between outputs from decision units  $34A_1$ ,  $34A_2$  and correlators  $32C_1$ ,  $32C_2$ . This is not what Applicant claims. Applicant's base claims are directed to cross-correlation in a receiver with a particular set of signals, wherein the particular set of signals is determined by minimizing the least-squares error between *the set of signals* and *the set of signature signals*.

Regarding claims 15-17, 19, 20, 22, 23, 25, 38, 40, 42, 43, 45, 46 and 48, the Examiner is mistaken in stating the signals are not a component of the receiver. The particular set of signals referred to in base claims 14 and 37 and used for cross-correlation are not arbitrary signals. They are selected as specified in the claim, "determined by minimizing the least-squares error between the set of signals and the set of signature signals," to provide the desired characteristics of the claimed receiver.

For at least the above reasons, Applicant submits that Fukawa does not disclose each and every element of Applicant's base claims 14 and 37. Accordingly, Applicant requests reconsideration and withdrawal of the rejections of claims 14-17, 19, 20, 22, 23, 25, 37, 38, 40, 42, 43, 45, 46 and 48 under 35 USC 102(b).

35 USC 103(a) Rejection: Claim 3

In the Office Action, claim 3 was rejected under 35 USC 103(a) as allegedly unpatentable over Bottomley in view of admitted art, paragraph 0004. Applicant respectfully traverses the rejection. Applicants statements with regard to Bottomley set forth above are repeated for this rejection with same effect. In paragraph 0004, Applicant indicates a class of prior art receivers that attempt to mitigate deleterious effects of multiple signal interference and background noise, and subsequently describes in paragraphs 0005-0006 how these prior art devices fail in various aspects. The discussion of paragraphs 0004-0005 does nothing to cure the deficiencies of Bottomley as set forth above. Since prior art matched filter receivers are recognized as having shortcomings, one would not be motivated to use a matched filter receiver due to its sub-optimal performance with respect to multi-user interference. Further, substituting a matched filter receiver for Bottomley's bank of correlators does not alter the transformation matrix specified by Bottomley so as to arrive at Applicant's claimed invention. Accordingly, for at least these reasons, Applicant submits that a *prima facie* case of obviousness has not been established, and requests reconsideration and withdrawal of the rejection of claim 3 under 35 USC 103(a).

35 USC 103(a) Rejections: Claims 12, 13, 35, and 36

In the Office Action, claims 12, 13, 35, and 36 were rejected under 35 USC 103(a) as allegedly unpatentable over Bottomley in view of Farsakh. In particular at pages 5-6, the Examiner cites Farsakh at column 5, line 65 to column 6, line 5 as information allegedly supporting obviousness of the claimed invention. Applicant respectfully traverses the rejection.

Farsakh is directed to a *spatial* multiplexing system which utilizes shaping of beam radiation lobes to separate signals within a spatial area. (Col. 1, lines 27-34) The cited sections of columns 5 and 6 pertain to "averaging the covariance matrices generated for each subscriber station." Sets of spatial covariance matrices are generated for each subscriber station, *i.e.* each mobile station, by multiple correlation steps. (Col. 5, lines 63 – Col. 6, line 1) These sets are then averaged for each subscriber station to provide an improved spatial covariance matrix. A spatial covariance  $C_k$  provides a "description of the downward path associated with the subscriber k, thus of the transmission channel from the base station BS to the mobile station MS." (Col. 8, lines 27-30.) Applicant does not recognize how the cited teachings relate to Applicants claims 12 and 35 which recite a correlation shaper "wherein the correlation shaper is

chosen so that a covariance matrix of the second output vector in the space in which it lies has the property that the second and subsequent rows are permutations of the first row.” The term “space” in Applicant’s claim pertains to N-dimensional mathematical space. The term “spatial” in the teaching of Farsakh is understood to pertain to 3-dimensional physical space. 3-dimensional spatial covariance matrices are not the subject of Applicant’s claimed invention. There is no averaging of sets of covariance matrices. No teachings or suggestions have been identified in Farsakh which cure the deficiencies of Bottomley nor teach or suggest the elements of Applicant’s claims. Accordingly, for at least these reasons, Applicant submits that a *prima facie* case of obviousness has not been established, and requests reconsideration and withdrawal of the rejection of claims 12, 13, 35, and 36 under 35 USC 103(a).

Double Patenting Rejections: Claims 14, 15, 16, 17, 19, 20, 22, 23, 25, 37, 38, 40, 43 and 46

Claims 14, 15, 16, 17, 19, 20, 22, 23, 25, 37, 38, 40, 43 and 46 stand provisionally rejected under nonstatutory obviousness-type double patenting in view of claims 13, 13, 16, 15, 16, 17, 18, 19, 20, 31, 31, 33, 35 and 37 respectively of Applicant’s co-pending application No. 09/788,890. Applicant requests that this rejection be held in abeyance until such a time whereupon a provisional rejection remains as the only rejection in one of the co-pending applications.

**CONCLUSION**

In view of the above, Applicant submits that presently pending claims **1-5, 9-17, 19-20, 22-23, 25-29, 33-38, 40, 42-43, 45-46** and **48** are in condition for allowance and early indication thereof is respectfully requested.

Respectfully submitted,  
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